REMARKS/ARGUMENTS

Claims 1-20 are pending in the present application. Claims 1, 11, 19 and 20 are amended. Support for amended claims 1and 11 may be found in Figure 4 and in the description on page 17, lines 22-25, and page 23, lines 20-23, with additional support for claim 11 on page 24, line 30 to page 25, line 1. Support for claim 20 may be found in Figure 2 and in the description on page 6, line 25 to page 7, line 4. Support for claim 19 is found in the claims themselves to record proper claim dependency from claim 18. Reconsideration of the claims is respectfully requested.

Applicants have amended some claims and canceled others. Applicants do not concede that the subject matter encompassed by the earlier presented claims is not patentable over the art cited by the Examiner. Applicants canceled and amended claims in this response solely to facilitate expeditious prosecution of this application. Applicants traverse all rejections and respectfully reserve the right to pursue the earlier-presented claims, and additional claims, in one or more continuing applications.

I. 35 U.S.C. § 101

The examiner has rejected claims 11-19 under 35 U.S.C. § 101 as being directed towards non-statutory subject matter. Applicants have amended independent claim 11 to claim use of statutory medium of "a computer readable storage medium" as suggested by the examiner. The amended claim 11 and respective dependent claims 12-19, therefore overcomes the rejection of claims 11-19 under 35 U.S.C. § 101.

II. 35 U.S.C. § 103, Obviousness

The examiner has rejected claims 1-4, 8-14, and 18-20 under 35 U.S.C. § 103 as being obvious over Michel, Cooperative Adaptive Web Caching Routing and Forwarding Web Content Data Requesting Method, U.S. Patent 7,146,429, (December 5, 2006), (hereinafter "*Michel*"), in view of Guha, System and Method for Rapidly Identifying the Existence and Location of an Item in a File, U.S. Patent 5,897,637, (April 27, 1999), (hereinafter "*Guha*") and further in view of *Bensoussan* et al. System and Method for Instant Consolidation, Enrichment, Delegation and Reporting in a Multidimensional Database, U.S. Patent 6,581,068, (June 17, 2003), (hereinafter "*Bensoussan*"). The Examiner states:

> As per claims 1, 11,20, Michel discloses a method of matching a Uniform Resource Locator (URL) to a resource or rule (see column 9, lines 48-51), comprising:
>
> progressively hashing a clause of the URL to generate a hash code for the clause (see column 11 lines 36-45 and Fig. 4A, *describing the hashing of a URL string*

and showing how a clause (i.e. a part of the URL separated by delimiters: http, org, www, etc.) has a hash code generated);

determining if a delimiting character is encountered (see column 11, lines 36-45; *where the URL is decomposed into components that are separated by delimiters such as a period, and slash mark, implying a determination if a delimiting character is encountered)*;

using the hash code associated with the clause to traverse a tree data structure representing clauses of URLs and corresponding resources or rules (see column 11, lines 24-30, *describing compiling the decomposition tree with successive hashing codes generated for each URL segment and column 12, lines 1-14, describing how the URL hash codes are traversed (i.e. hash codes used as indices in a forwarding table) when a web request is received in order to retrieve the requested web content)*; and

matching the URL to resources or rules based on the traversing of the tree data structure (see column 12, lines 54-66, *describing that web content data (ie. resource) is retrieved by traversing URL hash codes in the form of a forwarding table and pointers).*

Although the system disclosed by Michel shows substantial features of the claimed invention (discussed above), it fails to disclose progressively hashing character by character and wherein each node of the tree data structure has an associated multidimensional hash table.

Nonetheless, these features are well known in the art and would have been an obvious modification of the system disclosed by Michel, as evidenced by Guha in view of Bensoussan.

In an analogous art, Guha discloses a system for rapidly identifying the existence and location of an item in a file using a hash table architecture, searching for a particular item performed by identifying the appropriate hash bucket by obtaining a primary hash key for a search term (see Abstract). Further showing a character by character hashing algorithm used to create a hash code (see column 6, lines 5-10, *describing successive exclusive-OR operations on the characters forming the character string, where successive implies an operation done on each character making up the character string).*

Given the teaching of Guha, a person having ordinary skill in the art would have readily recognized the desirability and advantages of modifying Michel by employing a character by character hashing, such as disclosed by Guha, in order to generate a large number of unique hash codes.

In considering the multidimensional hash table, although the system disclosed by Michel in view of Guha shows substantial features of the claimed invention (discussed above), it fails to disclose that each node of the tree data structure has an associated multidimensional hash table.

> Nonetheless, these features are well known in the art and would have been an obvious modification of the system disclosed by Michel in view of Guha, as evidenced by Bensoussan.
>
> In an analogous art, Bensoussan discloses handling of data in multidimensional computer databases, and managing, aggregating and reporting data in a multidimensional database (see column 1,lines 8-12) and each account in the multidimensional database can hold multimedia content (see column 2, lines 5-8). Further, Bensoussan discloses the use of a multidimensional hash table (see column 9, lines 26-34, *describing a 3 dimensional hash table that contains data relating to an owner of the hashing table*). Furthermore, it is obvious to apply *Bensoussan* to Michel in view of Guha because URL data is hierarchical and the system of *Bensoussan* provides a storage system for retrieving data related to hierarchical data that can also be linked in the form of a tree structure (see column 7, lines 45-57 and column 7, line 66 - column 8, line 6, *describing how a three-dimensional cube can have a three-dimensional subcube attached with further details describing an element in the parent cube*).
>
> Given the teaching of Bensoussan, a person having ordinary skill in the art would have readily recognized the desirability and advantages of modifying Michel in view of Guha by employing a multidimensional hash table, such as disclosed by Bensoussan, in order to retrieve large amounts of hierarchical data quickly (see Bensoussan column 1, lines 33-42).

Office Action dated March 3, 2008, pp. 3-5 (emphasis in original).

The Examiner bears the burden of establishing a *prima facie* case of obviousness based on prior art when rejecting claims under 35 U.S.C. § 103. *In re Fritch*, 972 F.2d 1260, 23 U.S.P.Q.2d 1780 (Fed. Cir. 1992). The prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Royka,* 490 F.2d 981, 180 USPQ 580 (CCPA 1974). In determining obviousness, the scope and content of the prior art are… determined; differences between the prior art and the claims at issue are… ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or non-obviousness of the subject matter is determined. *Graham v. John Deere Co.*, 383 U.S. 1 (1966). "Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR Int'l. Co. v. Teleflex, Inc.*, 127 S. Ct. 1727 (April 30, 2007). "*<u>Rejections on obviousness grounds cannot be sustained by mere conclusory statements</u>;* instead, there must be some articulated reasoning with some rational underpinning to support the *<u>legal conclusion</u>* of obviousness. <u>Id</u>. (citing *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006))."

Claim 1 as amended is as follows:

> 1. A method of matching a Uniform Resource Locator (URL) to a resource or rule, comprising:
>
> progressively hashing a clause of the URL, character by character individually, to generate a hash code associated with the clause;
>
> determining if a delimiting character is encountered;
>
> using the hash code associated with the clause to traverse a tree data structure representing clauses of URLs and corresponding resources or rules, wherein each node of the tree data structure has an associated multidimensional hash table; and
>
> matching the URL to resources or rules based on the traversing of the tree data structure.

The proposed combination of *Michel*, *Guha* and *Bensoussan*, when viewed as a whole, does not teach or suggest all the claim limitations. In particular the combination of references does not teach the features of, "progressively hashing a clause of the URL, character by character individually, to generate a hash code associated with the clause," "using the hash code associated with the clause to traverse a tree data structure representing clauses of URLs and corresponding resources or rules, wherein each node of the tree data structure has an associated multidimensional hash table."

With regard to the feature of "progressively hashing a clause of the URL, character by character individually, to generate a hash code associated with the clause," *Michel* teaches hashing URL components combined to create a URL segment, as in:

> The sequence of hash codes produced by successively concatenating decomposed URL components and delimiters and successively applying the hashing function are collectively an incremental URL hash code sequence. Hence, the sequence of hash codes h1, h2, h3, h4, h5, h6, and h7 represents an incremental URL hash code sequence as a URL identifier produced by decomposing the URL http://www.aero.org/CSTS/CSRD/people.html into the components http, org, aero, www, CSTS, CSRD, and people.html.

Micehl col. 11 lines 36-45.

Michel, teaches use of components of the URL, collected together to form segments of the URL. In contrast the contrast the feature progressively hashes a clause of the URL, character by character, individually to generate a hash code. *Michel* does not hash the individual characters as claimed. The examiner also notes *Michel* does not provide the feature. Therefore *Michel* does not teach the claimed feature.

The examiner however believes *Guha* teaches the same feature. *Guha* teaches successive exclusive-OR operations performed on the character string of a URL, as in:

> For example, one such primary hash function 302 involves performing successive exclusive-OR operations on the characters forming the character

> string of the item. This results in a 16-bit hash key that is capable of uniquely identifying 2^{16}, or 65,536 different hash buckets 211, 212, 213.

Guha, col. 6 lines 5-10.

Each successive exclusive-OR operation uses a *pair of characters* in each step of the process to arrive at a result. In contrast the claimed feature progressively hashes *character by character, individually*. Therefore the claimed feature operates in a different manner from the teaching of *Guha*. Neither *Guha*, nor *Michel* teach the feature, therefore one reference cannot be used to provide the feature shown as missing from the other reference.

With regard to the feature of, "using the hash code associated with the clause to traverse a tree data structure representing clauses of URLs and corresponding resources or rules, wherein each node of the tree data structure has an associated multidimensional hash table," *Bensoussan* is believed to teach the claimed subject matter. *Bensoussan* teaches use of a multidimensional *database*, and not a hash table, as in the referenced portion:

> (3) Corporate data needs to be transformed into multidimensional aggregations supporting enterprise-scale data volumes and hierarchies; (4) Fast, consistent response to end-user requests is critical to interactive, ad-hoc exploration, comparison and analysis of data, regardless of database size and complexity; and (5) End users must be able to manipulate and derive data for analysis purposes by
>
> applying analytical operations such as ratios, cumulative totals, trends and allocations across dimensions and across hierarchical levels.

Bensoussan col. 1 lines 8-12.

Further *Bensoussan* teaches each member of a dimension has associated with it or "owns a hashing table that contains the set of all the amounts referenced by this member, as in Figure 13 and:

> FIG. 13 is a pictorial structural diagram showing the "instant consolidation" feature of the present invention, and more particularly the "data indexing" feature. A multidimensional database is shown having three primary dimensions, dim1, dim2 and dim3, representing three coordinate axes. Each member of the dimension has associated with it or "owns" a hashing table that contains the set of all the amounts referenced by this member. Each amount is linked to an entry in each of hashing tables of the members of the dimensions representing this amount.

Bensoussan col. 9 lines 25-34.

Bensoussan therefore provides a hash table for each dimension. In contrast, the feature claims each node of the tree data structure has an associated multidimensional hash table. As seen in Figure 13 and the referenced portion of *Bensoussan*, the cited reference teaches a multidimensional database but does not teach a multidimensional hash table. The entries are associated by "each amount is linked to an

entry in each of hashing tables," as opposed to a single entry in a multidimensional hash table. Therefore *Bensoussan* fails to teach the feature as claimed.

The examiner has further acknowledged that both *Michel* and *Guha* do not teach a multidimensional hash table. Therefore, because *Bensoussan* alos does not teach the feature, the combination of references does not teach the claimed feature. The proposed combination of *Michel*, *Guha* and *Bensoussan*, when considered in combination as a whole, does not teach the features as claimed. Accordingly, under the standard of *In re Royka*, the cited references when combined and considered as a whole, do not teach or suggest all the claim limitations. The combination of references, therefore do not provide a *prima facie* obviousness rejection of claim 1.

Because claims 2-10 depend from claim 1, the same distinctions between the cited references and the claimed invention in claim 1 apply equally well for these claims. Additionally, independent claims 11 and 20 claim similar subject matter as claim 1, therefore claims 11 and 20 are also distinguished from the cited references as are respective dependent claims 12-19. Therefore the rejection of claims 1-4, 8-14, 18-20 under 35 U.S.C. § 103 has been overcome.

III. <u>35 U.S.C. § 103, Obviousness</u>

The examiner has rejected claims 5, and 15 under 35 U.S.C. § 103 as being obvious over *Michel*, in view of *Guha*, in view of *Bensoussan*, and further in view of *Hendren*, <u>Selecting a Cache</u>, International Publication WO 00/58871, (October 5, 2000), (hereinafter "*Hendren*"). The Examiner states:

> As per claims 5, 15 although the system disclosed by Bensoussan discloses that the entries for subtrees in the multidimensional hash table are positioned in the multidimensional hash table using equation:
>
> $$\text{Th}\,\gamma\,\{\,(\text{h}\%\text{X}),\,(\text{h}\%\text{Y}),\,(\text{h}\%\text{Z})\,)$$
>
> wherein Th is a target object in the multidimensional hash table, h is a hash value for a root node of a subtree, and X, Y and Z are dimensions of the multidimensional hash table (see column 9, lines 26-34, *where dim 1, dim 2 and dim 3 can be named any variable such as after coordinates axes x y and z,* and see Fig. 13, *where it shows that an element in the cube is a hash table with the dimensions of x, y and z; thereby implying a target object is an entry positioned in the cube with a hash value of each dimension x, y and z),* it fails to specifically use a modulo operator.
>
> Nonetheless, these features are well known in the art and would have been an obvious modification of the system disclosed by Michel in view of Guha in view of Bensoussan, as evidenced by Hendren.
>
> In an analogous art, Hendren discloses a system for selecting one of a plurality of caches that store information received from network sites; and identifies the location of a resource within a domain and selecting a cache based on the

> information that identifies the location (see Abstract). Further, Hendren shows a hash function that transforms a complete URI into a number, the hash function could add the ASCII values of all the characters in the URI and modulo (i.e. %) divide by the number of caches (see page 8, lines 20-23).
>
> Given the teaching of Hendren, a person having ordinary skill in the art would have readily recognized the desirability and advantages of modifying Michel in view of Guha in view of Bensoussan by employing a modulo divide by the number of caches, such as disclosed by Hendren, in order to evenly distribute the resources among the cube. In considering doing a modulo by the dimensions, it is obvious since the hash table is multidimensional, the module would be performed on each side of the hash table in order to place the resource in the multidimensional hash table evenly.

Office Action dated March 3, 2008, pp. 6-7 (emphasis in original).

Claim 5 is as follows:

> 5. The method of claim 2, wherein entries for subtrees in the multidimensional hash table are positioned in the multidimensional hash table using the equation:
>
> $$Th\ \underline{\gamma}\{\ (h\%X)\ ,\ (h\%Y)\ ,\ (h\%Z)\ \}$$
>
> wherein Th is a target object in the multidimensional hash table, h is a hash value for a root node of a subtree, and X, Y and Z are dimensions of the multidimensional hash table.

With regard to claim 5, the combination of *Michel*, *Guha* and *Bensoussan* have been shown previously to not teach the claimed features on which claim 5 depends. The following portion of *Hendren* is addressed:

> For example the proxy 174 can implement a hash function that transforms a complete URI into a number. For example, a hash function could add the ASCII (American Standard Code for Information Interchange) values of all the characters in the URI and modulo divide by the number of caches.

Hendren, page 8 lines 20-23.

Applicants have previously shown that features of the base claim, upon which claims 5 and 15 rely, are not taught in the cited references. The proposed addition of *Hendren* does not teach the features missing in the base claim. Although *Hendren* teaches use of a modulo calculation, the teaching does not provide the teaching of features shown to be missing from the teaching of *Michel*, *Guha*, and *Bensoussan*.

Further, Figure 13 of *Bensousan* teaches an "amount" linked to an entry in each of the hashing tables of the members, and therefore does not teach a multidimensional hash table. The teaching of *Hendren* is directed toward an even distribution among a number of caches, and not within a specific cache. Therefore *Hendren* does teach the claimed feature of entry position within a hash table.

Therefore the proposed combination of *Michel*, *Guha*, *Bensoussan* and *Hendren* does not teach the claimed features of claim 5 and therefore claim 5 is distinguished from the cited references as is claim 15, having similar features. Therefore the rejection of claims 5, and 15 under 35 U.S.C. § 103 has been overcome.

IV. 35 U.S.C. § 103, Obviousness

The examiner has rejected claims 6-7, and 16-17 under 35 U.S.C. § 103 as being obvious over *Michel*, in view of *Guha*, in view of *Bensoussan*, and further in view of Agrawal et al, Selecting a Cache, International Publication WO 00/58871, (October 5, 2000), (hereinafter "*Agrawal*"). The Examiner states:

> Although the system disclosed by Michel in view of Guha in view of Bensoussan shows substantial features of the claimed invention (discussed above), it fails to disclose that the has table is created by growing the multidimensional hash table such that hash collisions are avoided.
>
> Nonetheless, these features are well known in the art and would have been an obvious modification of the system disclosed by Michel in view of Guha in view of Bensoussan, as evidenced by Agrawal.
>
> In an analogous art, Agrawal discloses a system for performing database queries using hash-based grouping methods (see Abstract). Further, Agrawal shows the advantages of using an array-based multidimensional hash table in order to avoid collisions (see column 14, lines 17-22, *since an array is used and collisions do not occur, implies that the hash table is able to grow to fit all of the hash values without collisions).*
>
> Given the teaching of Agrawal, a person having ordinary skill in the art would have readily recognized the desirability and advantages of modifying Michel in view of Guha in view of Bensoussan by employing a hash table such that collisions are avoided, such as disclosed by Agrawal, in order to avoid collisions, thereby avoiding the need to compare values after hashing (see Agrawal column 16, lines 53-55)
>
> As per claims 7, 17, Agrawal further discloses that the multidimensional table is grown by a total number of dimensions for the multidimensional (see column 5, lines 22-29, *describing the steps involved in determining how a data cube should be generated based on the set of attributes and aggregate functions and column 4, lines 38-67, describing the N-dimensional cube operator that is used depending on the number of aggregate functions, thereby implying that the dimensions of the cube are grown based on the number of attributes).*

Office Action dated March 3, 2008, pp. 7-8 (emphasis in original).

Claim 6 is as follows:

> 6. The method of claim 2, wherein the multidimensional hash table is created by growing the multidimensional hash table such that hash collisions are avoided.

With regard to the feature of, "wherein the multidimensional hash table is created by growing the multidimensional hash table such that hash collisions are avoided," *Agrawal* teaches:

> There are two classes of hash tables, the two classes being based on whether collisions within a bucket are allowed.
>
> The non-collision based hashing scheme reduces to a multidimensional array, if it is assumed that data attributes are mapped into contiguous unique integers during a pre-pass of the data.

Agrawal col. 14 lines 17-22.

> Based on these estimates, the method with the smaller memory requirement is chosen. When memory is not a constraint, the Hash-Array method is preferable, since values need not be compared after hashing.

Agrawal col. 16 lines 53-55.

Agrawal thus teaches mapping data attributes into contiguous unique integers when memory is not a constraint. Further *Agrawal* teaches no need to store all values as only the *aggregate* values are stored (col. 14 lines 35-36). There is no evidence provided to detail growth of the hash table as suggested by the examiner. Growth may not be presumed, since the memory may be sized to hold the largest value at initialization. In contrast the feature specifically claims *growing* multidimensional hash table such that hash collisions are avoided.

Therefore *Agrawal* does not teach the feature as claimed. The combination of references when considered as a whole does not teach the feature of claim 6, and is therefore distinguished from the teaching of *Agrawal* as is claim 16 having the similar feature, and respective dependent claims 7 and 17.

With regard to claims 7 and 17, the examiner states "*Agrawal* further discloses that the multidimensional table is grown by a total number of dimensions for the multidimensional." The following portions of *Agrawal* are cited in support of the assertion:

> As stated above, a data cube operator is an N-dimensional generalization of simple aggregate functions. Thus, a data cube is a data structure which is stored in memory, but which has the characteristics of N-dimensionality.
>
> FIG. 1(a), which is a reproduction of FIG. 2 of the Gray et al. paper, illustrates, on a conceptual geometric level, the information provided by data cube operators for different dimensions. The example given is for automobile sales, the attributes being color (red, white, blue), make (Chevy, Ford), and year (1990, 1991, 1992, 1993)
>
> A 0-dimensional data cube operator is a single total sum value, which may be visualized as a single point.

> A 1-dimensional data cube operator, for the single attribute of color, is a one-dimensional vector of values for the color attribute, plus a total sum. This may be visualized as a line or linear sequence of values, plus a point for the total sum.
>
> A 2-dimensional data cube operator, for the two attributes color and make, is a cross tabulation, which includes a two-dimensional array of all possible combinations for make and color, two one-dimensional vectors of total sales for each color and total sales for each make, and a total sum. Geometrically, this may be visualized as a plane, two lines, and a point.
>
> A 3-dimensional data cube operator, for the three attributes color, make, and year, includes a three-dimensional array of all possible combinations for color, make, and year, and three intersecting two-dimensional cross tabulations.

Agrawal col. 4, lines 38-67.

> First information is input (step 2). This information includes an overall relation, a set of attributes of the relation, and aggregate functions characterized by combinations of the attributes. This step is typically carried out in the course of entering data into a database.
>
> Given this information, in accordance with the invention a data cube is generated.

Agrawal col. 5 lines 22-29.

Agrawal teaches the creation of a data cube based on factors of, "an overall relation, a set of attributes of the relation, and aggregate functions characterized by combinations of the attributes." *Agrawal* therefore does not teach implying that the dimensions of the cube are grown based on the number of attributes, because the factors of relations and aggregate functions must be considered.

Therefore *Agrawal* does not teach the feature of claim 7. Because claim 17 has a similar feature as claim 7, claim 17 is also distinguished from the teaching of *Agrawal*. Therefore the rejection of claims 6-7, and 16-17 under 35 U.S.C. § 103 has been overcome.

V. <u>Conclusion</u>

The subject application is patentable over the cited references. Therefore, the subject application should now be in condition for allowance. Applicants invite the Examiner to call the undersigned at the below-listed telephone number if, in the opinion of the Examiner, a telephone conference would expedite or aid the prosecution of this application.

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Respectfully submitted,

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